



U.S. Fish & Wildlife Service

The Hackensack Meadowlands Initiative

Preliminary Conservation Planning

An Overview of the Comprehensive Document



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An Overview



Satellite image of the Hackensack Meadowlands District (boundaries in red) and the surrounding metropolitan region.

(Cover) Bellmans Creek Marsh in the northern Meadowlands District, ©Mike Light / www.michaellight.net.

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The Hackensack Meadowlands Initiative: Preliminary Conservation Planning (Plan) of March 2007, prepared by the U.S. Fish and Wildlife Service, details human recreational, agricultural, industrial, and scientific activities in the Hackensack Meadowlands and their effect on the Meadowlands ecosystem in some 450 pages. That comprehensive document remains an indispensable resource for understanding ecological issues in the Meadowlands. This overview summarizes ideas and issues discussed in the original document. It

may also serve as a guide to direct the reader to specific areas of interest in the *Plan*. The U.S. Fish and Wildlife Service hopes that Meadowlands stakeholders as well as the public at large will find this overview useful as an introduction and connection to the issues elaborated in the comprehensive *Plan*.



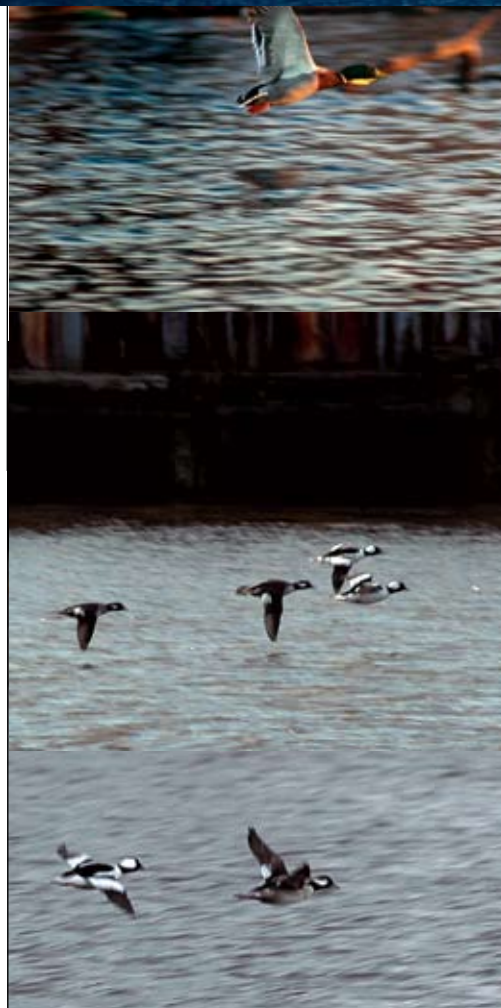
The Mission of the U.S. Fish and Wildlife Service is working with others to conserve, protect and enhance fish, wildlife, plants and their habitats for the continuing benefit of the American people.

I. The Hackensack Meadowlands Initiative

The Hackensack Meadowlands is the largest brackish estuarine complex in the New York-New Jersey Harbor estuary and among the largest in the northeastern United States. Over the past few centuries, the Meadowlands has suffered from hydrologic alterations throughout its watershed, such as dams and reservoirs, extensive contamination from industrial activities, and ongoing invasions by exotic species. Nonetheless, the Meadowlands ecosystem still attracts and supports a remarkable diversity of fish and wildlife, including federally protected species such as migratory birds. Thus, with the continuing nationwide shift of our human population from rural to urban and suburban areas, the Meadowlands is a prime example of the Nation's environmental challenges, clearly demonstrating that if we do not take care of our fish and wildlife resources now, we will pay even greater environmental, financial, and social costs in the future.

The U.S. Fish and Wildlife Service established the *Hackensack Meadowlands Initiative* as a partnership to clean up, restore, and protect this ecosystem. The *Initiative* provides the U.S. Fish and Wildlife Service, its government partners, and other stakeholders with an unparalleled opportunity to promote the growing positive image of this long-neglected urban coastal ecosystem and to improve the quality of life for the 20 million people living in the surrounding urban area.

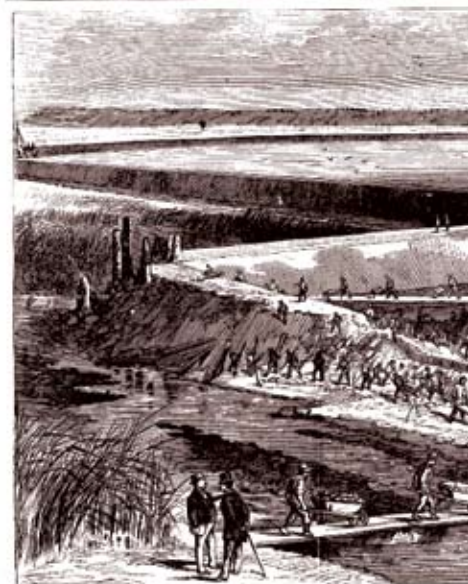
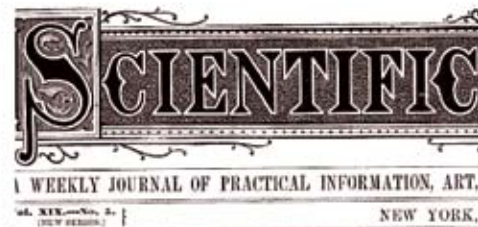
Building upon the previous efforts of State, Federal, and local agencies, the U.S. Fish and Wildlife Service has developed the *Hackensack Meadowlands Initiative: Preliminary Conservation Planning (Plan)* as a guide for cleaning up, enhancing, restoring, and protecting the Meadowlands and its biodiversity. Though developed as a first step, the *Plan* contains extensive information about the challenges to restore the Meadowlands and protect its fish and wildlife resources. This overview of the *Plan* was developed to provide the public with an understanding of the *Initiative's* interests and concerns in restoring the Meadowlands and protecting its biodiversity. Restoring and protecting the Meadowlands ecosystem and its fish and wildlife will require that all stakeholders work together, guided by a common vision.



Morning along the Hackensack River.

The U.S. Fish and Wildlife Service's Vision for the Meadowlands:

- (1) a more natural estuarine ecosystem with healthy fish and wildlife resources;
- (2) a cleaner environment (progressive reduction in acute and chronic contaminant effects);
- (3) diverse, native wetland and associated communities that sustain local and regional populations of native species, including federal trust fish and wildlife resources; and
- (4) public commitment to and benefits from the Meadowlands.



DIKING AND DRAINING THE MEADOWLANDS.



SEEKING A PLATE.

The draining of swamp lands is not a new idea. Such lands are not only unproductive of anything which can achieve any important purpose, but they are productive of numerous evils. Turning with science, the home of mischievous and annoying insects they are hidden upon the otherwise fair face of nature. To render them fruitful, and productive of good rather than evil, is a problem for which a solution has been anxiously sought, but hitherto only partially obtained. No system applicable to all cases has been discovered, and only three methods have been adopted in the past to any great extent; viz., the slow process of pumping, ditching, and the creation of dikes or levees. These methods are not only expensive at the outset, but inefficient and costly to maintain. The dikes of Holland are embankments made with heavy timbers and filled in with stone, the surface being covered with bundles of faggots and rods fastened down by stakes. Also piles are driven into



the sand and protected by and stones. In some places, protect slopes, and the will supply the material for this purpose, walls of masonry towards the sea, are used to the action of the waves.

II. Human Use History

Understanding the human uses and misuses of the Meadowlands is vital to addressing their adverse impacts upon this ecosystem and to preventing their needless duplication elsewhere in the United States. Humans have lived in the Hackensack Meadowlands for roughly 10,000 to 12,000 years. During most of that time the small, native Lenape population had minimal impacts upon the landscape. However, soon after arriving, European colonists in the region began

exploiting the Meadowlands' abundant resources and initiated large-scale ditching, diking, and other modifications to control mosquitoes and accommodate agriculture and transportation.

Lithographs from a July 1868 issue of *Scientific American* illustrate how failure to understand the ecological value of wetlands contributed to human destruction and exploitation of crucial natural resources. The article featured the labors of the Iron Dike & Land Reclamation Company, founded by real estate developer Samuel N. Pike. Pike made use of inventor Spencer B. Driggs' designs for "driving iron plates into the soil and joining them end to end, thus presenting an unbroken and impenetrable iron wall, which may be extended to any required length, and the durability of which is unquestionable." However, the reclaimed land grew lush stalks but not a single ear of corn.

With continued human population growth and land-use manipulation, the Meadowlands timber, fishery, and water resources were rapidly exhausted. As the natural water supply of the Hackensack River became inadequate to supply human demands within the watershed, tributary flows of the nearby Passaic River basin and other watersheds were diverted into the Hackensack watershed and stored in the Oradell Reservoir to provide drinking water. With the human population's continued growth, the Meadowlands became increasingly degraded. Several generations of Americans continued to dike, drain, ditch, fill, and misuse the Meadowlands ecosystem. It was not until a century later that we began to see wetlands as valuable for humans as well as fish and wildlife.

Since the turn of this century, non-governmental organizations and State and Federal agencies have joined in an unprecedented manner to protect and restore the Meadowlands. These organizations and agencies have begun several projects to restore specific sites, manage fish and wildlife resources, and educate the public on the value of urban wildlife reserves, nature sanctuaries, and functional wetlands. Such activities are moving environmental restoration forward and make clear the need for, and importance of, improved collaborative efforts to restore the Meadowlands ecosystem and protect its resources.

Critical long-term actions for restoring and protecting the Meadowlands ecosystem

- (1) Initiate an extensive monitoring program of the Meadowlands' environmental conditions (e.g., air, soil, sediment, and water) and biodiversity.
- (2) Regularly assess and revise clean-up, restoration, enhancement, and management efforts in the Meadowlands.
- (3) Improve comprehensive water- and land-use planning among Federal, State, and local governments, and other stakeholders throughout the Meadowlands, the Hackensack River watershed, and nearby areas.



THE NEW JERSEY MEADOWS.



planking, as well as by earth, turf or wicker work is used to cover and flow is cultivated extensively to purpose. In places of great ex- with piles driven upon the side to protect the embankments from



SECTION OF EMBANKMENT.

The line of the dike and the dike level are examples of the reclaiming of waste-land and unproductive swamp lands and trans- forming them into fertile and productive fields. These works are, however, not the result of private enterprise. In order to complete them, it was necessary to seek and obtain govern- mental aid.

An annual expense of \$30,000 such is re- quired to keep the dikes of Holder and West Chapel, at the western extremity of the island of Watchung, in repair. The annual expendi- ture is sufficient for maintaining the dikes and the regulation of the water level to from two to two and one half millions dollars. Watchmen to patrol the dikes and to give the alarm when danger threatens, and engineers to apply the proper means in cases of emergency, are constantly employed.

As we have said, these measures are only partially success- ful. Water permeates through such artificial embankments,

Development projects along the Hackensack River.



III. Natural History

The Meadowlands has been marked by significant change for more than 10,000 years—the retreat of the Wisconsin glacier, the formation of a glacial lake, the breaching of the lake’s terminal moraine and subsequent draining of its surface waters to create a tidal river, and the arrival of different human groups. The Meadowlands remains one of the largest and most productive brackish estuarine wetland complexes in the northeastern United States, and it continues to support considerable biodiversity, including dozens of State-listed and other species that are of special conservation concern. The Meadowlands is an urban oasis for many species of plants and animals that find little alternative habitat available in the highly urbanized, regional landscape.

The most visible animals in the Meadowlands are birds. Approximately 40% of the 800+ species of migratory birds in North America use the Meadowlands as breeding or wintering habitat, or as a “stopover” in which to feed and rest during their spring and fall migrations. Eliminating or degrading even one migratory stopover may adversely affect populations in such faraway places as the Arctic and South America.

Small numbers of savannah sparrow, State-listed as threatened, nest in several different habitats in the Meadowlands and feed on upland and wetland prey (insects, crustaceans, small mollusks). Large numbers of dunlin migrate through the Meadowlands during spring and fall. Dunlin can be seen foraging on mud flats with their long bills, which they use to feed on small crustaceans, mollusks, and worms living in the mud.

Available information is limited for many taxonomic groups but indicates that invertebrates, fishes, amphibians, reptiles, birds, and mammals remain imperiled by existing conditions. As coastal areas in the New England and middle-Atlantic States continue to be modified and degraded, the Meadowlands becomes more critical as an environmental oasis for supporting the region’s biodiversity. Thus, development of a comprehensive plan to clean up, enhance, and restore the Meadowlands ecosystem is critical to sustain the region’s fish and wildlife.



Gene Nieminen / USFWS

Dunlin can be seen foraging on mud flats with their long bills, which they use to feed on small crustaceans, mollusks, and worms living in the mud.



Atlantic sturgeon.

Duane Raver / USFWS



Shortnose sturgeon.

Biodiversity in the Meadowlands

The Meadowlands provides habitats for more than
275 species of plants,
115 species of invertebrates,
45 species of fishes,
25 species of amphibians and reptiles,
332 species of birds, and 24 species of mammals.

More than 90 species of plants and animals in the Meadowlands are rare or managed species.



Peter Weber / wildbirdphotos.com

Savannah sparrow, State-listed as threatened, nest in several different habitats in the Meadowlands and feed on upland and wetland prey (insects, crustaceans, small mollusks).

IV. Hydrology and Contaminants

As the human population has grown throughout the region, the landscape of the Meadowlands ecosystem, the surrounding Hackensack River watershed, and other nearby watersheds have been increasingly modified and degraded. Many modifications, such as dams, reservoirs, and river diversions have been made to satisfy the public demand for drinking water. For example, as much as 50 million gallons of water are diverted daily from the Passaic River through Pascack Brook into the upper Hackensack River watershed. Despite this diversion into the watershed, water withdrawals from storage reservoirs have resulted in a reduction in the natural flow of freshwater through the Meadowlands. Secondary treated sewage effluent is now the largest source (about 80%) of “freshwater” in the Meadowlands and is likely to become an even larger component of the freshwater in the basin as water use increases. Many endocrine disruptors (interfering with the metabolism of hormones responsible for maintenance, reproduction, development, and/or behavior) have been reported in sewage effluent and may become toxicologically important to the Meadowlands and its biota. However, not all endocrine disruptors will biomagnify in the food chain to such an extent as mercury, PCBs, and dioxins.

Changes in the hydrology and use of the Hackensack River or nearby waterbodies such as the Passaic River, and Newark Bay or their adjoining wetlands and uplands can change the distribution and availability of contaminants. Sewage effluents, together with run-off from combined sewer overflows, non-point source run-off, landfill leachates, pollutants from industrial sites, and contaminants transported by tides have created a mosaic of heavily contaminated sediments washed by waters with excessive nutrient concentrations, abundant microbes, and oxygen-poor water. As a result, water quality in the Hackensack River remains inferior to water quality throughout the rest of the Hudson-Raritan estuary. Poor water quality, including low oxygen concentration, adversely affects growth, survival, and reproduction of fish, shellfish, and other aquatic life, especially during the summer.

Several contaminants that originated and dispersed from localized “hotspots” have become widely distributed in the Meadowlands and have considerable potential to affect fish and wildlife adversely. For example, Berry’s Creek, which adjoins three of the seven Superfund sites in the Meadowlands, is recognized as among the world’s most severely

mercury-contaminated aquatic sites. Other contaminants of significant concern in the Meadowlands are not only toxic but also act as endocrine disruptors as they bioaccumulate through food chains and cause adverse effects on growth, survival, and reproduction. Also, the high concentrations and broad distribution of some contaminants raise serious concerns that if wetlands are restored physically but not chemically remediated, they could function as attractive nuisances and create population sinks. As a result of the bioaccumulation of certain contaminants, the State of New Jersey has developed consumption advisories for blue crab and 11 species of fish occurring in tidal or freshwater portions of the Hackensack River watershed.

Addressing the hydrologic modifications to, and contamination of, the Hackensack River watershed is among the greatest challenges to restoring the Meadowlands ecosystem and protecting its biodiversity. For example, storm surge and flooding, expected to accompany even modest sea level rise, have the potential to increase scouring of sediments and redistribute contaminants throughout these water bodies. Failure to reduce contaminant availability in the Meadowlands may also create greater problems with continuing increases in use of the region’s water resources and likely discharges of new contaminants into the environment.

The contaminant types of greatest concern in the Meadowlands area are

1. Mercury - toxic; possibly carcinogenic (causes cancer), mutagenic (causes mutations), and teratogenic (alters development); bioaccumulative (chemical concentration increases because of an inability to break down or excrete the chemical); diverse sublethal effects on growth, development, behavior, and reproduction,
2. PCBs - toxic; endocrine disrupting, carcinogenic; bioaccumulative; diverse sublethal effects on development, behavior, and reproduction, and
3. Dioxins - toxic; carcinogenic; endocrine disrupting; bioaccumulative; diverse sublethal effects on metabolism, development, and reproduction.



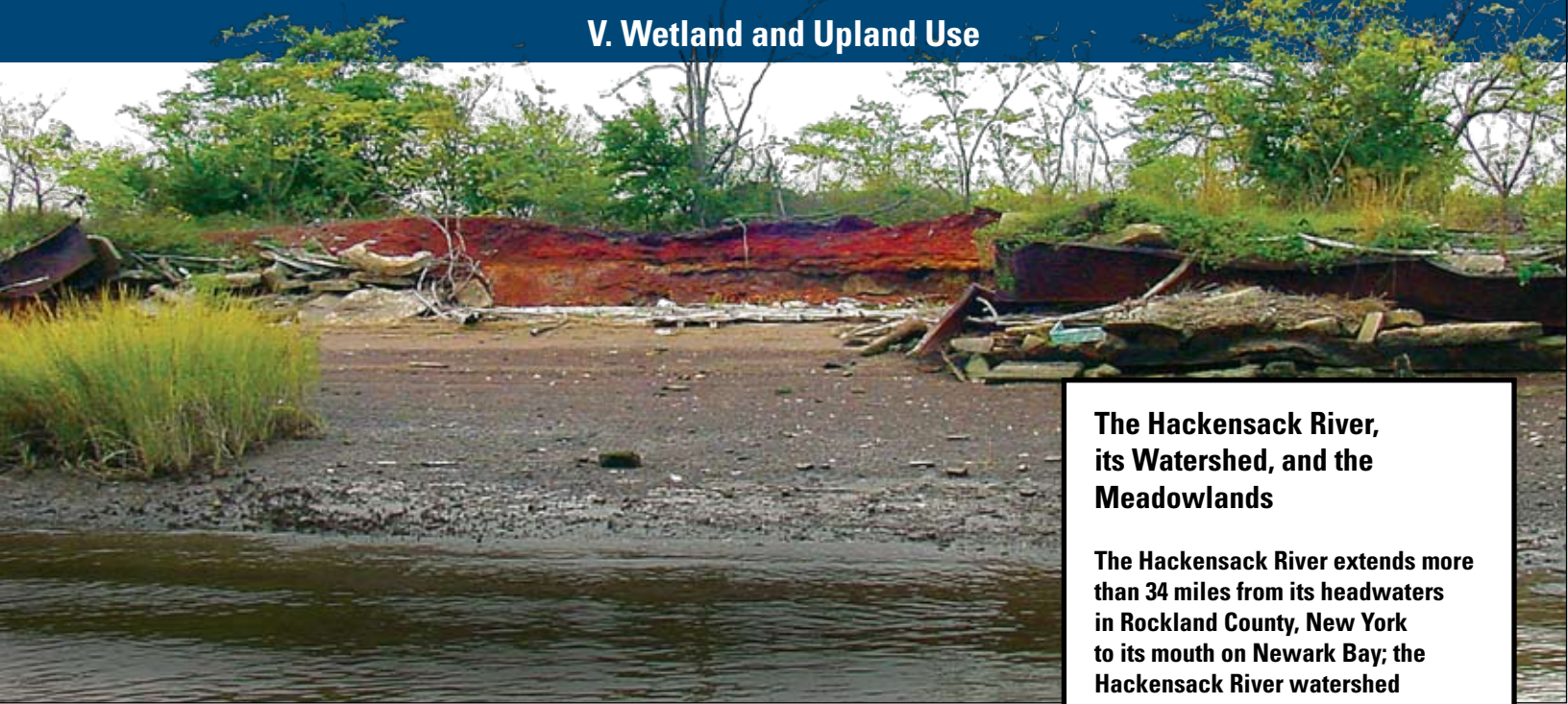
Recommendations Regarding Hydrology and Contaminants

1. Develop a comprehensive program to monitor and assess contaminants (including new and bioaccumulative compounds) and their effects.
2. Integrate regional planning regarding water supplies (including their conservation and re-use), sewage treatment, stormwater, flood control, restoration, and sea level rise.
3. Develop a plan to coordinate and integrate the State’s commitment to clean up and restore the Berry’s Creek marshes with Federal Superfund and other restoration programs.
4. Investigate the movements, diets, and reproduction of fish and wildlife species in the Meadowlands and surrounding region. Conduct contaminant studies before and after all restoration projects to ensure that such projects do not create attractive nuisances or population sinks, but support healthy wildlife populations.

What are attractive nuisances and population sinks?

An “attractive nuisance” is a site that is enticing to wildlife due to an abundance of food and cover, but nonetheless dangerous to health or life. Availability and accumulation of contaminants must be consistently monitored during restoration activities in the Meadowlands to refine and improve subsequent restoration efforts.

A “population sink” is an area-specific portion of an animal population in which the mortality rate exceeds the birth rate.. Populations in these “sinks” can be maintained only by animals that migrate from a more productive population source.



A contaminated site along the Hackensack River.

V. Wetland and Upland Use

Historical human uses throughout the Hackensack River watershed in this densely populated area have caused (1) substantial losses of wetlands and adjoining uplands, (2) alteration of wetlands, and (3) fragmentation of the remaining natural landscape and other disruptions to the Meadowlands ecosystem. Wetlands in the Meadowlands continue to change and remain under considerable threat from human activities and other processes such as sea level rise. Thus, concerted restoration and land-use planning efforts are essential to undo historical adverse impacts to the Meadowlands ecosystem and its fish and wildlife resources.

The above photograph bears witness to past land-use decisions in the Meadowlands, but more importantly, it presents opportunities for improving the functioning of the Meadowlands to sustain populations of healthy fish and wildlife.

A. Wetland and Upland Losses

More than 70% of the former wetlands in the Meadowlands have been destroyed, mostly by filling. Industrial by-products and household waste have often been used to fill wetlands. Foul-smelling, yellowed layers of chromium-contaminated waste were used as fill along the shoreline near a factory that once refined the metal. Cleaning up chromium contamination at a 30-acre site in Jersey City, projected to cost \$900 million, will prevent continuing adverse impacts to human as well as fish and wildlife health.

Most upland areas throughout the watershed also have been developed, and little open space remains. Vegetated uplands that adjoin wetlands buffer storm runoff, improve water quality, support fish and wildlife, provide recreational opportunities, and increase property values. Only 13% of the wetland buffer area in the Meadowlands is vegetated. Restoring waterfront sites will help fish, wildlife, and people.

B. Wetland Alterations

More than 70% of the Meadowlands' wetlands were ditched and diked in the 1800s and 1900s for agriculture and mosquito control. The Meadowlands today reflects historical and modern alterations: docks jut out into deep waters, bulkheads turn shorelines into rigid barriers that reduce biodiversity, and tide-gates affect tidal currents, wildlife, and boat traffic. Perhaps an omen of sea level rise, the Meadowlands' wetlands are increasingly being "drowned" and converted into deepwater habitats.

C. Fragmentation and Other Disruptions to the Meadowlands Ecosystem

Roads, railroads, bridges, and highways crisscross the Meadowlands, with fragmentation effects that exceed the loss of habitat. These structures support much-needed commerce and other human activities; however, improvements in assessing, planning, and monitoring infrastructure projects are essential to reduce their public costs, which include adverse impacts on fish and wildlife. Species susceptible to fragmentation such as northern harrier and savannah sparrow are

The Hackensack River, its Watershed, and the Meadowlands

The Hackensack River extends more than 34 miles from its headwaters in Rockland County, New York to its mouth on Newark Bay; the Hackensack River watershed covers 202 square miles. Nineteen subbasins lie within the watershed, which is divided by the Oradell Dam into two distinct sections:

- (1) an upper, non-tidal, freshwater area, which contains four major water-storage reservoirs, and
- (2) a lower, tidal, mostly brackish area, which includes the wetlands traditionally referred to as the Hackensack Meadowlands or the Meadowlands ecosystem (and the legislatively defined boundaries of the Hackensack Meadowlands District).

The types, condition, and functioning of wetlands in the upper and lower areas differ considerably, yet wetlands in both areas provide important ecosystem functions and critical support for the region's biodiversity. Thus, Meadowlands stakeholders must focus attention on protecting wetlands and adjoining uplands throughout the entire watershed.

disappearing in the Meadowlands. Flashing lights marking powerlines and communications towers attract birds and other wildlife to a tangled web of guywires and antennas. More than 48 communication towers taller than 200 feet are located in or around the Meadowlands; additional towers may be proposed to accommodate digital television broadcasting. The individual and cumulative impacts of all of these artificial structures in the Meadowlands are poorly understood.



Berry's Creek.

VI. Invasive and Exotic Species

One of the most common images throughout the Meadowlands is the vast sea of giant grass called common reed, also known as *Phragmites*. During the last century, a nonnative strain of common reed known as Haplotype M spread throughout the Meadowlands and much of North America. This form of common reed chokes out other plant life and may reduce animal diversity and production. Because of these adverse impacts on plants and animals, eradication of common reed has been a major component of restoration activities to date throughout the Meadowlands. However, Haplotype M is difficult to eradicate throughout much of the Meadowlands and is re-invading most restored sites. Haplotype M also grows well in heavily contaminated sediments and stabilizes erosion from some contaminated sites, thus reducing the bioavailability and subsequent effects of certain contaminants on fish and wildlife.

The U.S. Fish and Wildlife Service's vision for the Meadowlands includes replacement of common reed and other invasive species with native plant communities that are typical of the regional landscape and better support native fish and wildlife populations. However, common reed may be the most acceptable plant on heavily contaminated sites prior to their eventual remediation. The U.S. Fish and Wildlife Service and other stakeholders must develop a protocol for the sequential removal of common reed from contaminated sites throughout the Meadowlands.

Common reed is not the only invasive species that is widespread in the Meadowlands: new exotic species arrive in the New York-New Jersey Harbor on an almost daily basis. Although most exotic species do not survive for long, those that do survive compete with or prey upon native species. Purple loosestrife, Japanese knotweed, and tree-of-heaven are spreading at many sites, and have substantial, adverse impacts on native fish and wildlife species. Because invasive species, including disease-causing agents, may change biological communities and ecosystem processes, restoring the Meadowlands will not be successful unless programs to monitor and control invasive species are developed for the Meadowlands and the entire New York-New Jersey Harbor.

Key Recommendations Regarding Invasive Species

- (1) Assess the effects of common reed on fish and invertebrate biodiversity and production.
- (2) Develop a protocol for the removal of common reed from contaminated sites.
- (3) Investigate biocontrol of common reed.
- (4) Develop a comprehensive harbor-wide program to prevent, monitor, assess, control, and eradicate invasive species.

Common invasive plants.



VII. Resource Objectives

Historical adverse impacts on fish and wildlife populations are substantial throughout the Meadowlands ecosystem; however, many adverse impacts can be reversed through: (1) remediation, enhancement, and restoration, (2) adaptive management based on monitoring of completed restoration projects, and (3) improved project and land-use planning throughout the region. Because further modification, degradation, and loss of wetlands and adjoining uplands due to land-use and other human activities remain likely, the U.S. Fish and Wildlife Service strongly supports the acquisition, clean-up, enhancement, and restoration of remaining wetlands and adjoining uplands throughout the entire watershed.

Acquisition

Considerable progress has been made by the New Jersey Meadowlands Commission in acquiring wetlands in the Hackensack Meadowlands District; the U.S. Fish and Wildlife Service supports the Commission's efforts to acquire and preserve all remaining wetlands and adjoining uplands as open space. Acquisition of wetlands and adjoining uplands outside the District throughout the Hackensack River watershed is necessary to safeguard and sustain the Meadowlands ecosystem and its biodiversity. The U.S. Fish and Wildlife Service recommends coordinating such efforts through the Meadowlands Conservation Trust, which seeks to conserve natural areas throughout the Hackensack River watershed.

Protection

All levels of government (Federal, State, and local) have important roles in protecting the Meadowlands ecosystem and its fish and wildlife resources. Implementation of laws and regulations pertaining to wetlands must be consistent to protect wetlands-dependent fish and wildlife resources throughout the District. Federal, State, and local laws and regulations should be reviewed regularly to address any loopholes. Stakeholders should review and consider designating the Meadowlands a marine/estuarine protected area to promote and provide comprehensive long-term protection.

Site Remediation

Landfills represent considerable challenges to remediating, enhancing, and restoring the Meadowlands and sustaining its biodiversity. On former wetlands, landfills presently provide extensive and contiguous yet degraded upland habitats for fish and wildlife. Some landfills are being remediated with portions redeveloped to provide residential and commercial opportunities. Instead, certain landfills and other degraded industrial sites should be remediated and restored to provide upland "buffer" habitats that control stormwater runoff, improve water quality, and provide shelter, foraging, and nesting habitats for native species.

Contamination presents substantial challenges to remediation and restoration. In particular, the availability of contaminants and their effects on fish and wildlife have not been adequately assessed. Contaminant sampling and other studies are needed to guide remediation, enhancement, and restoration. Also, because restoration activities on one site have the potential to increase contaminant exposure and availability on another site, an overall picture of the suitability of different sites for restoration is needed.

Restoration and its Challenges

Certain sites throughout the Meadowlands indicate the potential for enhancement and restoration to support native biodiversity. The Meadowlands' Sawmill Creek was established in 1975 as New Jersey's only urban Wildlife Management Area (WMA). Diking for mosquito control in the early 1900s promoted the spread of common reed and led to further degradation of its marshes. In 1950, a northeaster destroyed the dikes and "restored" tidal flows to the Sawmill Creek marshes. Today, the Sawmill Creek's extensive mudflats and cordgrass-marshes provide diverse habitats used by many animal species. However, the Sawmill Creek WMA also is fragmented by rail and road beds and is being converted slowly to

Sawmill Creek



open water, which may be a preview of the effects of sea level rise on the Meadowlands. Thus, the Sawmill Creek WMA not only provides inspiration for enhancing and restoring marshes but also illustrates the diverse challenges to safeguarding its fish and wildlife resources.

Biodiversity

Establishing diverse vegetative communities comprised of native species is a major U.S. Fish and Wildlife Service objective for the Meadowlands. Plant diversity in wetlands and uplands can be improved substantially by eradicating common reed, planting desired species, allowing re-colonization by native species, monitoring on-site vegetation, and treating common reed that re-invades sites before it becomes re-established. Restoring the Meadowlands to its former state as an Atlantic white-cedar forest is unrealistic given the watershed's current hydrology; however, increasing the extent, diversity, and native composition of its wetlands is vital to sustaining and safeguarding fish and wildlife resources. Increasing the extent

and quality of upland buffer areas will promote the recovery of wetland vegetation and the functioning of restored wetlands and will also provide upland habitat for migratory birds and other species. Increasing upland vegetative diversity will also better sustain animal diversity in uplands and adjoining wetlands.

The Meadowlands retains considerable biodiversity despite the extirpation of species that historically occurred there, a testament in part to the resiliency and adaptivity of many species. Available information, though limited for many taxonomic groups, indicates that aquatic and terrestrial communities of invertebrates, fishes, amphibians, reptiles, birds, and mammals remain imperiled by poor water quality, contamination, and other stressors such as invasive species. Programs targeted at re-establishing populations of "keystone species," which affect the abundance and diversity of other species, may further assist the recovery of biodiversity in the Meadowlands.

Acquiring, Protecting, Remediating, and Restoring the Hackensack Meadowlands

To date, efforts by the

- New Jersey Meadowlands Commission,
- Meadowlands Conservation Trust,
- New Jersey Department of Environmental Protection,
- U.S. Army Corps of Engineers,
- U.S. Fish and Wildlife Service,
- U.S. Environmental Protection Agency, and
- National Oceanic and Atmospheric Administration

to acquire, protect, remediate, and restore different sites in the Hackensack Meadowlands show promise, although the goals and objectives vary. Coordination among these groups will be vital to prevent conflicts, make efficient use of limited public and private funds, and protect the health and well-being of fish, wildlife, and people.

1-E Landfill.



VIII. Research and Education

Research and public education are vital to restoring the Meadowlands ecosystem and protecting its fish and wildlife resources.

A. Research

The development of monitoring, assessment, and research capabilities among Federal and State agencies and other stakeholders is essential to successful restoration. Research programs should focus especially on the following:

- (1) environmental contaminants, water quality, and hydrology,
- (2) suburban/urban ecosystems, landscapes, and habitats, and
- (3) invasive and exotic species.

Communication of research needs and results among all stakeholders is critical to ensure that decision-making for the Meadowlands is based on sound science.

B. Education

Scientists are not alone in needing more information about the Meadowlands. Every one of the 20 million residents of the New York metropolitan area has the potential to

effect change in the entire estuary. A well-informed citizenry is essential to promote and sustain the environmental clean-up and restoration of the Meadowlands; therefore, development of a unified public outreach program by all stakeholders is necessary to generate and maintain public support. Development of a unified outreach program should build on previous successes of stakeholders; use various media, including television; communicate key messages in several languages to reach the culturally diverse populace in the surrounding urban area; and use access and facilities developed for recreational objectives. Formal and informal educational programs, demonstration projects, and other public exhibits will help stimulate public interest and inspire involvement in Meadowlands issues. Continued public support for research and education is vital to future efforts to remediate and restore the Meadowlands and to ensure responsible land use and management. Area residents must be encouraged to take pride in the Meadowlands, appreciate its value, advocate restoration, and seek active participation in recovery efforts. Public action today will benefit future generations.

Illustrating the Need for Information

Restoring the common reed-covered wetlands at the Marsh Resources Inc.'s (MRI) Meadowlands Mitigation Bank began in 1999. The major steps included

- (1) treating stands of common reed with herbicide,**
- (2) removing dead vegetation and other debris,**
- (3) excavating, dredging, and re-grading the site to improve tidal flow, and**
- (4) planting and seeding with native species.**

Today, native species that were not planted dominate many restored portions of the Marsh Resources Inc. (MRI) site, and the site is used by a diversity of fish and wildlife species. Restoring the MRI site has raised many questions regarding native volunteer species and their value to fish and wildlife populations. Understanding the factors that enabled these species to colonize this site may help us enhance and restore other sites.

Marsh Resources Inc.'s Meadowlands Mitigation Bank in 1999.



IX. Public Access and Recreation

Located only 7 miles west of Manhattan, the Meadowlands lies within 50 miles of nearly 20 million people. Cleaning up and restoring the Meadowlands has the potential to provide far-reaching benefits to many people in the urban region. Such benefits include outdoor recreational activities uncommon in the region, increased local property values and business opportunities, an improved quality of life, and a greater awareness and appreciation of the environment. Public access to, and use of, restored sites often shape the public's perception of the success of restoration projects. To reclaim the Meadowlands ecosystem for future generations of Americans, its clean-up and restoration must increase public access and integrate human uses of open space while sustaining and safeguarding fish and wildlife.

Increased public use of the Meadowlands has the potential to impact fish and wildlife adversely and must be carefully planned and monitored. Surveys of public uses and perceptions of the Meadowlands should be conducted as a starting point toward increasing public access and recreational use. The U.S. Fish and Wildlife Service supports public uses such as wildlife observation, photography, fishing, and waterfowl hunting that have minor, if any, adverse impacts on fish and wildlife when properly planned, managed, and regulated.



A blue crab.



Schoolchildren and chaperones along the Mill Creek Trail.

Certain public uses of the Meadowlands' resources could be harmful. For example, the State of New Jersey currently prohibits harvesting blue crabs from the Hackensack River due to their bioaccumulation of mercury, PCBs, and dioxins. This prohibition represents an "impaired use" of the resource, which must be addressed through remediation of contaminants in the Meadowlands. Otherwise, not only will fish and wildlife populations remain at risk from exposure to contaminants, but social and recreational uses of the Meadowlands will remain limited. Aggressively addressing contaminants and use impairments will help strengthen public confidence and support for restoring the Meadowlands.

The Meadowlands and its adjoining waterways in the Hackensack River watershed have always been a public resource, and all involved in planning for its redevelopment, remediation, and restoration must embrace the Meadowlands as a public treasure. Increasing public access and recreational use are crucial objectives in cleaning and restoring this urban ecosystem. Thus, all stakeholders must recognize the potential value of a restored and revitalized Meadowlands ecosystem to the public and work together to promote a vibrant, positive image for this long-neglected urban area.

Laurel Hill County Park boat ramp.





State and federal wildlife officials tour the Meadowlands.

X. Restoration Planning and Coordination

A number of remediation, enhancement, and restoration projects are now underway or in various planning stages for specific wetland sites in the Meadowlands and adjoining waters. Projects such as the Hackensack Meadowlands Environmental Restoration and the Lower Passaic River Restoration are being pursued under the authority of the Water Resources Development Act, the Comprehensive Environmental Response, Compensation, and Liability Act (Superfund), and other laws for various purposes such as water resource improvement and contaminant remediation. Not only are these projects scheduled independently of each other by different Federal and State agencies, but in addition, progress on certain projects may be affected by procedural requirements or litigation.

As a result, cleaning up, enhancing, and restoring different sites are difficult to coordinate. In addition, clean-up and restoration must be integrated with other regional planning for water supply, sewage treatment, flood control, and transportation. Funding is an additional concern, since it may be inadequate for improving larger sites that may offer greater wildlife benefits. For successful restoration of the Meadowlands ecosystem over the long term, stakeholders should explore the development of a specific funding authority similar to what has been established for other large-scale restoration projects in the Missouri River, Florida Everglades, and lower Colorado River.

Preliminary results of some ongoing restoration activities are encouraging; nevertheless, stakeholders must collaborate more fully to ensure the broad, long-term commitments and coordination

necessary for comprehensive remediation, enhancement, and restoration of the Meadowlands ecosystem. To provide overall direction to such efforts, the U.S. Fish and Wildlife Service has initiated the development of a shared vision and proposed that stakeholders consider establishing a unifying authority to restore the entire Meadowlands ecosystem. The U.S. Fish and Wildlife Service has also taken preliminary steps together with other stakeholders to establish: (1) a principals' group of senior representatives from Federal and State agencies, and (2) a communication and coordination process involving other stakeholders. Improved collaboration and long-term coordination will more effectively address the challenges in restoring the Meadowlands and protecting its fish and wildlife resources.

Stakeholders Work Session at the New Jersey Meadowlands Commission facilities at DeKorte Park in Lyndhurst, New Jersey.



XI. Conclusions

During the past few centuries, the Meadowlands was transformed by human activities—its forests harvested, its rivers and streams dammed, its marshes filled, and its land, water, and air degraded. The Meadowlands' forests, meadows, waterways, and marshes were replaced by reservoirs, industrial sites, drainage systems, landfills and other contaminated sites, combined sewer overflows, sewage treatment plants, and large pipes discharging into the lower Hackensack River. Untold biodiversity was lost during this transformation; yet surprisingly, considerable biodiversity remains.

Today, the Meadowlands is surrounded by an extensively modified landscape that is the home and workplace of one of the largest urban populations in North America. Once again, the Meadowlands is being transformed by human activities—its landfills and industrial sites are being cleaned up, invasive species are being controlled to enhance biodiversity, and tidal currents are being restored to its diked and ditched marshes. If carefully planned and implemented, clean-up, enhancement, and restoration activities can revitalize the Meadowlands for fish, wildlife, and people well into the future.

For the Meadowlands ecosystem to recover, sustain fish and wildlife resources, and nourish a new image for this long-neglected urban area, Meadowlands stakeholders must embrace a central concept:

“Everybody (man and organisms) lives downstream of everybody else in an estuary.”

Eugene Odum (1971)

Nonetheless, remediation and restoration of the Meadowlands will not be accomplished overnight and will require *comprehensive* actions to address its complex problems, especially contamination. Monitoring and follow-up analyses will be needed to inform prudent decision-making. Because restoring the Meadowlands will likely take decades, stakeholders should investigate establishment of a unifying Federal authority. For such an authority to be developed, the long-neglected wetlands, waterways, and fish and wildlife of the Meadowlands must be recognized as public resources and the Meadowlands as one of the region's unique public treasures. The U.S. Fish and Wildlife Service and other stakeholders must work in a coordinated effort, guided by a common vision, to maintain and protect the Meadowlands ecosystem, including its fish and wildlife resources, for future generations.



Least sandpipers at Mill Creek.



Schoolchildren enjoying spring in the Meadowlands.



“We have fallen heirs to the most glorious heritage a people ever received, and each one must do his part if we wish to show that the nation is worthy of its good fortune.”

Theodore Roosevelt



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The Hackensack Meadowlands Initiative



The Hackensack Meadowlands Initiative *Preliminary Conservation Planning*

Produced by the NJFO in March 2007.
A 450-page document available as a 52MB download
at the URL below or on CD by request.

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